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should be taken not to set it too far out, as, by so doing, the clew would be lowered, the strain of the sheet fall too much on the foot, and one night, with a strong breeze, might considerably injure the standing of the sail.

No. IV.

REPEATING STOP FOR A SEXTANT.

The GOLD ISIS MEDAL *was this Session presented to Mr. T.* REYNOLDS, *13, Arbour Terrace, Commercial Road, for a Repeating Stop for a Naval Sextant, which has been placed in the Society's Repository.*

IN the sextant, as ordinarily constructed, an observation or angular measurement being made, must be read off and registered before the instrument can be used for a second observation. The only inconvenience attending this, in day observations, is the interval which it necessarily makes between two successive observations. But during this interval clouds may interpose to prevent a second observation; and in all cases where the mean of several successive ones is wanted, the shorter the interval that occurs between them, the more are they to be relied on. In night observations the advantages of expedition are still greater than by day, because the interval between two successive ones is necessarily much lengthened by being obliged to go to a light on deck, or, it may be, in the cabin, in order to read off the result. It is also found, that when the eye is brought from almost darkness into a bright light, a certain time is required for that organ to adjust itself before the sight becomes sufficiently distinct to perceive minute objects, and consequently to make an observation and read off its result with the necessary correctness. By means of Mr. Reynolds's repeating stop, which, at a small expense, may be applied to any instrument now in use, five observations may be made in succession without the necessity of reading off, because the bolts in the repeating stop will register the first four, and the index of the instrument will register the last as usual. The only thing, therefore, required for the observer to be aware of, is, that the results of the observations are read off in an order precisely the reverse of that in which they were made.

The invention has received the approbation of the Admiralty, of Mr. Lamont of the Greenock Observatory, of Mr. Lynn, and of Commander Low, R.N., whose testimonials are hereto subjoined, as well as of many professional men, who are at present using it.

Hydrographical Office, Admiralty,
September 21, 1827.

SIR,

I am directed by Sir George Cockburn to acquaint you, that you are at liberty to make use of the approbation of the Admiralty for your invention, agreeable to the request you made.

In addition, from myself, I sincerely wish you success in disposing of it, for, though simple, I think it will be of great use to navigators.

I am, Sir, &c. &c.

Mr. REYNOLDS.

J. WALKER.

SIR, *Greenock, March* 19, 1829.

I have lately got a sextant much improved by an ingenious contrivance of yours, whereby several altitudes or distances of the heavenly bodies may be observed at very short intervals of time, and may be afterwards read off when convenient. This is effected so accurately by your invention, that I have never been able to detect the least difference between the readings immediately after the observations, and on being reset, by means of the stop, even with the aid of a deep microscope.

After fifty years' experience in the use of that description of instruments, I consider the *repeating stop* the most important addition to them during all that long period. Now, I feel convinced, that by this means night observations may be made with all the ease and accuracy that can be attained with day-light; a point which every one versant in such matters must be aware is of the greatest consequence, and hitherto looked for in vain.

I am, Sir, &c. &c.

Mr. REYNOLDS. COLIN LAMONT.

SIR, *Greenock, March* 20, 1829.

I have lately had an opportunity of observing with a sextant provided with your repeating stop, and have invariably found that the arch could be as correctly read off when reset by its means, as if it were at the time of observation. I feel assured that, by means of your invention, night observations of altitude or distances can be made and read off with as much ease and accuracy as those made with day-light, as I have made myself certain that the stop affords the means of resetting with great accuracy. I have much pleasure in stating my conviction that this repeating stop is the most valuable addition the sextant has received in my experience, which extends to the last fifteen years.

I am, Sir, &c. &c.

Mr. ***Reynolds.*** C. Lamont, Jun.

Sir, *Leadenhall Street, March* 13, 1829.

In answer to your communication, requesting my opinion of a certain instrument, invented by your father, to attach to the limb of a sextant or quadrant, for the purpose of registering three, four, or more angles observed in the night or day, without the necessity of reading the angles off till the whole quantity are completed; — I have pleasure in testifying that I consider it a very ingenious instrument, and that, if it be properly used, it will fully answer the desirable purpose for which it was intended, and save much inconvenience that is experienced in reading off the angles upon the deck of a ship, where lights are always more or less inconvenient, and oftentimes inadmissible.

I am, Sir, &c. &c.

Thomas Lynn,

Late Commander in the Service of the H. E. I. Company, and now Examiner of the Officers of that Service in Nautical Astronomy, &c.

Mr. ***Reynolds****, jun.*

Sir, 160, *New Bond Street, March* 24, 1829.

Leaving town in haste, to attend at the Royal Naval College, Portsmouth, according to a recent arrangement of the Admiralty, I commit to paper the substance of those remarks which I made to you in the rooms of the Society of Arts, at first sight of the repeating stop, or auxiliary to the sextant, invented by Mr. Reynolds. And although this letter may not comprise all that I could say were it in my power to attend the committee on Thursday next, yet I trust it will clearly convey a favourable opinion as to the merits of the invention.

Means of registering observations made at sea with the sextant, on the arch of the instrument itself, have long been most anxiously desired by every careful and accurate observer, chiefly for the following reasons: —

1st, Because, for what are called lunar observations, even on board some of his majesty's ships, a sufficient number of able, attentive assistants for measuring the altitudes, noting the time, &c., could not at all times, by night and day, be spared from other duties, neither could they, while doing so, be exempted from sudden calls and interruptions, that frequently arise from shifts of wind, approaching squalls, and consequent necessities of trimming, shortening, and making sail; whilst on board of merchant-vessels, in general, such assistants are not to be found. But, with means of registering a few sights on the arch of each instrument used, it is obvious that one good observer, having an assistant only to note time, would be found equal to the management of a sextant and two quadrants for measuring the angular distance and the altitudes of the moon and a star, or other celestial objects, so as to determine the longitude with as much accuracy as is usually attained at sea.

2dly, Because, in cloudy weather, opportunities, when the objects are most clear, not unfrequently are lost, or wasted, in reading off and setting down the time, distance, and altitudes of a single observation; whereas, by using instruments with a register on the arch of each, a series of three, five, or seven sights, according to the capability of the register, might be obtained, and the mean, in proportion to the number of sights and the rapidity of succession, better be relied on than a single sight, or the mean of several with long intervals between them.

3dly, Because, by night, the last-mentioned disadvantage is not only increased from the difficulty of reading off by the help of a lantern, but the vision of the observer is confused by the alternate contracting and dilating of the pupil, in passing from the tempered light of the celestial objects to darkness, then again to the strong light reflected from the platina of the arch and vernier-scale in reading off.

4thly, Because, when much time is occupied in making astronomical observations, requiring great care and accuracy, at sea, awkward and constrained positions of the body, the rolling of the ship, the duties going on, the slightest yawings, or unavoidable deviations from the course, bringing rigging, sails, masts, yards, or booms, between the celestial objects and the principal observer, have each a tendency to affect his nerves so sensibly, that it is not always easy to preserve the coolness and self-possession absolutely requisite to attain the necessary accuracy.

The invention of Mr. Reynolds particularly recommends itself to mariners, from the ease and cheapness with which it can be fitted, by tolerable workmen, to quadrants or sextants of every material, small or large, old or new; but it seems to me, above all things, worthy of remark, that whilst this little appendage to the sextant serves to register several sights on the arch, it also prevents that progression of the index in the direction of the last impetus given, the result of which is not easily ascertained.

Whilst I feel that it is presumptuous in me to offer opinions to a Society of which I am not a member, and to which I have not in any way recommended myself, yet I cannot help observing, that this first attempt (as I believe it to be) of registering observations on the arch of the sextant merits regard as an improvement in the art of navigation; and that to this nation every invention tending to render the conducting of ships more safe and economical, cannot be less important in its nature than if it went to the improvement of agriculture or of manufactures; but the very simple invention of Mr. Reynolds is, in fact, an improvement in the manufacture of mathematical instruments, in which we already excel.

I am, Sir, &c. &c.

JOHN M'ARTHUR LOW,
Commander R.N.

A. AIKIN, Esq.
Secretary, &c. &c.

Reference to the Engraving. Plate VII.

Figs. 6, 8, 9, and 10, are different views of the stop. Fig. 6 shews it in use; fig. 8 is a lateral view; fig. 9 is a view of its under side; fig. 10 is a section.

The same parts in all the figures are indicated by the same letters of reference.

The stop is made to slide easily, but smoothly, on the graduated limb *qq*, fig. 6, of the instrument, and may be fixed at any part by means of the screw *b*, which commands the clamp-plate *p*, figs. 8 and 9. It has one fixed stopping-pin *c*, figs. 6 and 9, and three sliding-bolts or stops *d e f*, each of which has a square-headed binding-screw *g h i*, capable of being turned, and therefore of being fixed or released by the mill-headed key *k*, fig. 8.

The stops slide between the lower plate *a a* and the upper plate *l l*, figs. 8 and 10; the distance between the plates being preserved without change by means of a collet *o*, fig. 8, at each of the four corners.

In the upper plate are three slits *m m m*, fig. 6; and in the lower plate are three corresponding slits *n n n*, fig. 9, in which the stops slide: the two slits for the stop *d* are shorter than those for the stop *e*, as those for this latter stop are shorter than the slits for stop *f*: the stop to be first used has the shortest slit, and that to be last used has the longest slit.

To prepare the stop for use, loosen the clamp-plate *b*, and push back the stops, in which position the pin *c* will project a little beyond the ends of the stops. As soon as the first observation has been made, the index is to be fastened by the screw *r*, fig. 6; the frame which carries the stops is to be slid up gently till the pin *c* touches the end of the index, and is then to be secured in its place by the screw *b*; this registers the first observation. The screw *r* being then loosened, the second observation is to be made, and the index screw is to be again fastened: the index will now be in advance of the end of the pin, and its precise situation is registered by merely sliding the stop *d* till it touches the end of the index, and then securing it by the binding-screw *g*. A third observation is made in the same way as the second, and is in like manner registered by the slide *e*. The fourth observation is registered by the slide *f*; and the fifth observation is made and registered by the index itself.

But the repeating-stops will only act when the series of observations is occasioning the index to recede from the stop-frame, as already described; there must, therefore, be two stop-frames, one on each side of the index; and in preparing the instrument for use, that stop-frame which is not wanted must be slid along the arc, and secured at a sufficient distance from the index not to interfere with it.

No. V.

TILLER FOR A DISABLED RUDDER.

The SILVER ISIS MEDAL *was voted to* W. PRINGLE GREEN, *Esq., Lieutenant R. N., for his Tiller for a disabled Rudder; a Model of which is in the Society's Repository.*

IT appears that in naval actions ships are sometimes very seriously disabled by the upper part of the rudder in which the tiller is inserted being shot away. On the occurrence of such an accident, Lieutenant Green recommends the use of an iron yoke, as represented in Plate IX., figs. 10, 11.

This yoke is composed of the clip *n* bolted to the bars or levers *c c*, which latter are kept steady by the tie *q* (represented separately, fig. 12). The several parts of the yoke must, of course, be on board the vessel, and, for convenience of stowage, may be detached, as a very short time would suffice to put them together. *v v* are four chains by means of which the yoke is to be lowered,